



Analytical Laboratory

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13339 Hagers Ferry Road
Huntersville, NC 28078-7929
McGuire Nuclear Complex - MG03A2
Phone: 980-875-5245 Fax: 980-875-4349

Order Summary Report

Order Number: J11100039

Customer Name(s): Bill Kennedy, Melonie Martin, Wayne Chapman, Tom Johnson

Customer Address: 3195 Pine Hall Rd
Mailcode: Belews Steam Station
Belews Creek, NC 28012

Lab Contact: Jason C Perkins **Phone:** 980-875-5348

Report Authorized By: _____ **Date:** 10/27/2011
(Signature)

Program Comments:

Please contact the Program Manager (Jason C Perkins) with any questions regarding this report.

Data Flags & Calculations:

Any analytical tests or individual analytes within a test flagged with a Qualifier indicate a deviation from the method quality system or quality control requirement. The qualifier description is found at the end of the Certificate of Analysis (sample results) under the qualifiers heading. All results are reported on a dry weight basis unless otherwise noted.

Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)

Certification:

The Analytical Laboratory holds the following State Certifications : North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

Sample ID's & Descriptions:

Sample ID	Plant/Station	Collection Date and Time	Collected By	Sample Description
2011021606	BELEWS	12-Oct-11 11:08 AM	TO	FGD Purge Eff
2011021607	BELEWS	12-Oct-11 10:56 AM	TO	EQ TANK EFF.
2011021608	BELEWS	12-Oct-11 10:29 AM	TO	BIOREACTOR 1 INF.
2011021609	BELEWS	12-Oct-11 10:35 AM	TO	BIOREACTOR 2 INF.
2011021610	BELEWS	12-Oct-11 10:41 AM	TO	BIOREACTOR 2 EFF.
2011021611	BELEWS	12-Oct-11 10:22 AM	TO	FILTER BLANK
2011021612	BELEWS	12-Oct-11 10:22 AM	TO	Trip Blank
2011021613	BELEWS	12-Oct-11 10:29 AM	TO	BIOREACTOR 1 INF.
2011021614	BELEWS	12-Oct-11 10:29 AM	TO	HG BLANK BIOREACTOR 1 INF.
2011021615	BELEWS	12-Oct-11 10:35 AM	TO	BIOREACTOR 2 INF.
2011021616	BELEWS	12-Oct-11 10:35 AM	TO	Hg Blk BioReactor 2 Inf
2011021617	BELEWS	12-Oct-11 10:41 AM	TO	BIOREACTOR 2 EFF.
2011021618	BELEWS	12-Oct-11 10:41 AM	TO	Hg Blk BioReactor 2 Eff
13 Total Samples				

Technical Validation Review

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Checklist:

COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures).

☒ Yes

☐ No

All Results are less than the laboratory reporting limits.

☐ Yes

☒ No

All laboratory QA/QC requirements are acceptable.

☒ Yes

☐ No

The Vendor Laboratories have been qualified by the Analytical Laboratory

Yes

Report Sections Included:

☒ Job Summary Report

☒ Sample Identification

☒ Technical Validation of Data Package

☒ Analytical Laboratory Certificate of Analysis

☐ Analytical Laboratory QC Report

☒ Sub-contracted Laboratory Results

☐ Customer Specific Data Sheets, Reports, & Documentation

☐ Customer Database Entries

☒ Chain of Custody

☒ Electronic Data Deliverable (EDD) Sent Separately

Reviewed By: DataBase Administrator

Date: 10/27/2011

Certificate of Laboratory Analysis

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Order # J11100039

Site: FGD Purge Eff
Collection Date: 12-Oct-11 11:08 AM

Sample #: 2011021606
Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<u>INORGANIC IONS BY IC</u>							
Bromide	88	mg/L		10	EPA 300.0	25-Oct-11 07:45	JAHERMA
<u>MERCURY (COLD VAPOR) IN WATER</u>							
Mercury (Hg)	317	ug/L		5	EPA 245.1	21-Oct-11 09:04	AGIBBS
<u>TOTAL RECOVERABLE METALS BY ICP</u>							
Boron (B)	182	mg/L		0.5	EPA 200.7	24-Oct-11 13:15	DJSULL1
<u>DISSOLVED METALS BY ICP-MS</u>							
Selenium (Se)	1130	ug/L		10	EPA 200.8	19-Oct-11 12:01	KRICHAR
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>							
Arsenic (As)	159	ug/L		10	EPA 200.8	19-Oct-11 12:25	KRICHAR
Chromium (Cr)	228	ug/L		10	EPA 200.8	19-Oct-11 12:25	KRICHAR
Copper (Cu)	126	ug/L		10	EPA 200.8	19-Oct-11 12:25	KRICHAR
Nickel (Ni)	188	ug/L		10	EPA 200.8	19-Oct-11 12:25	KRICHAR
Selenium (Se)	6080	ug/L		20	EPA 200.8	19-Oct-11 12:25	KRICHAR
Silver (Ag)	< 10	ug/L		10	EPA 200.8	19-Oct-11 12:25	KRICHAR
Zinc (Zn)	228	ug/L		20	EPA 200.8	19-Oct-11 12:25	KRICHAR
<u>SELENIUM SPECIATION</u>							
Vendor Parameter	Complete				V_AS&C		
<u>TOTAL DISSOLVED SOLIDS</u>							
TDS	18000	mg/L		200	SM2540C	19-Oct-11 13:25	TJA7067

Site: EQ TANK EFF.
Collection Date: 12-Oct-11 10:56 AM

Sample #: 2011021607
Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<u>MERCURY (COLD VAPOR) IN WATER</u>							
Mercury (Hg)	199	ug/L		2.5	EPA 245.1	21-Oct-11 09:07	AGIBBS
<u>TOTAL RECOVERABLE METALS BY ICP</u>							
Boron (B)	163	mg/L		0.5	EPA 200.7	24-Oct-11 13:19	DJSULL1
<u>DISSOLVED METALS BY ICP-MS</u>							
Selenium (Se)	1150	ug/L		10	EPA 200.8	19-Oct-11 12:04	KRICHAR

Certificate of Laboratory Analysis

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Order # J11100039

Site: EQ TANK EFF.

Collection Date: 12-Oct-11 10:56 AM

Sample #: 2011021607

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP-MS							
Arsenic (As)	113	ug/L		10	EPA 200.8	19-Oct-11 11:19	KRICHAR
Chromium (Cr)	168	ug/L		10	EPA 200.8	19-Oct-11 11:19	KRICHAR
Copper (Cu)	90.2	ug/L		10	EPA 200.8	19-Oct-11 11:19	KRICHAR
Nickel (Ni)	142	ug/L		10	EPA 200.8	19-Oct-11 11:19	KRICHAR
Selenium (Se)	4110	ug/L		10	EPA 200.8	19-Oct-11 11:19	KRICHAR
Silver (Ag)	< 10	ug/L		10	EPA 200.8	19-Oct-11 11:19	KRICHAR
Zinc (Zn)	160	ug/L		20	EPA 200.8	19-Oct-11 11:19	KRICHAR

Site: BIOREACTOR 1 INF.

Collection Date: 12-Oct-11 10:29 AM

Sample #: 2011021608

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP							
Boron (B)	152	mg/L		0.5	EPA 200.7	24-Oct-11 13:22	DJSULL1
DISSOLVED METALS BY ICP-MS							
Selenium (Se)	1200	ug/L		10	EPA 200.8	19-Oct-11 12:07	KRICHAR
TOTAL RECOVERABLE METALS BY ICP-MS							
Arsenic (As)	< 10	ug/L		10	EPA 200.8	19-Oct-11 11:22	KRICHAR
Chromium (Cr)	11.9	ug/L		10	EPA 200.8	19-Oct-11 11:22	KRICHAR
Copper (Cu)	< 10	ug/L		10	EPA 200.8	19-Oct-11 11:22	KRICHAR
Nickel (Ni)	10.8	ug/L		10	EPA 200.8	19-Oct-11 11:22	KRICHAR
Selenium (Se)	1240	ug/L		10	EPA 200.8	19-Oct-11 11:22	KRICHAR
Silver (Ag)	< 10	ug/L		10	EPA 200.8	19-Oct-11 11:22	KRICHAR
Zinc (Zn)	< 20	ug/L		20	EPA 200.8	19-Oct-11 11:22	KRICHAR

SELENIUM SPECIATION

Vendor Parameter Complete V_AS&C

Site: BIOREACTOR 2 INF.

Collection Date: 12-Oct-11 10:35 AM

Sample #: 2011021609

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
TOTAL RECOVERABLE METALS BY ICP							
Boron (B)	154	mg/L		0.5	EPA 200.7	24-Oct-11 13:26	DJSULL1

Certificate of Laboratory Analysis

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*This report shall not be reproduced, except in full.***Order # J11100039**

Site: BIOREACTOR 2 INF.

Collection Date: 12-Oct-11 10:35 AM

Sample #: 2011021609

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>							
Arsenic (As)	< 10	ug/L		10	EPA 200.8	19-Oct-11 11:25	KRICHAR
Chromium (Cr)	< 10	ug/L		10	EPA 200.8	19-Oct-11 11:25	KRICHAR
Copper (Cu)	< 10	ug/L		10	EPA 200.8	19-Oct-11 11:25	KRICHAR
Nickel (Ni)	15.9	ug/L		10	EPA 200.8	19-Oct-11 11:25	KRICHAR
Selenium (Se)	191	ug/L		10	EPA 200.8	19-Oct-11 11:25	KRICHAR
Silver (Ag)	< 10	ug/L		10	EPA 200.8	19-Oct-11 11:25	KRICHAR
Zinc (Zn)	< 20	ug/L		20	EPA 200.8	19-Oct-11 11:25	KRICHAR

Site: BIOREACTOR 2 EFF.

Collection Date: 12-Oct-11 10:41 AM

Sample #: 2011021610

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<u>INORGANIC IONS BY IC</u>							
Bromide	78	mg/L		10	EPA 300.0	25-Oct-11 08:00	JAHERMA
<u>MERCURY (COLD VAPOR) IN WATER</u>							
Mercury (Hg)	< 1	ug/L		1	EPA 245.1	21-Oct-11 09:09	AGIBBS
<u>TOTAL RECOVERABLE METALS BY ICP</u>							
Boron (B)	153	mg/L		0.5	EPA 200.7	24-Oct-11 13:30	DJSULL1
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>							
Arsenic (As)	< 5	ug/L		5	EPA 200.8	19-Oct-11 11:28	KRICHAR
Chromium (Cr)	< 5	ug/L		5	EPA 200.8	19-Oct-11 11:28	KRICHAR
Copper (Cu)	< 5	ug/L		5	EPA 200.8	19-Oct-11 11:28	KRICHAR
Nickel (Ni)	< 5	ug/L		5	EPA 200.8	19-Oct-11 11:28	KRICHAR
Selenium (Se)	14.2	ug/L		5	EPA 200.8	19-Oct-11 11:28	KRICHAR
Silver (Ag)	< 5	ug/L		5	EPA 200.8	19-Oct-11 11:28	KRICHAR
Zinc (Zn)	< 10	ug/L		10	EPA 200.8	19-Oct-11 11:28	KRICHAR
<u>SELENIUM SPECIATION</u>							
Vendor Parameter	Complete				V_AS&C		

Site: FILTER BLANK

Collection Date: 12-Oct-11 10:22 AM

Sample #: 2011021611

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<u>DISSOLVED METALS BY ICP-MS</u>							
Selenium (Se)	1.17	ug/L		1	EPA 200.8	19-Oct-11 10:42	KRICHAR

Certificate of Laboratory Analysis

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Order # J11100039

Site: Trip Blank

Collection Date: 12-Oct-11 10:22 AM

Sample #: 2011021612

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<u>TOTAL RECOVERABLE METALS BY ICP</u>							
Boron (B)	< 0.05	mg/L		0.05	EPA 200.7	24-Oct-11 12:59	DJSULL1
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>							
Arsenic (As)	< 1	ug/L		1	EPA 200.8	19-Oct-11 10:30	KRICHAR
Chromium (Cr)	< 1	ug/L		1	EPA 200.8	19-Oct-11 10:30	KRICHAR
Copper (Cu)	< 1	ug/L		1	EPA 200.8	19-Oct-11 10:30	KRICHAR
Nickel (Ni)	< 1	ug/L		1	EPA 200.8	19-Oct-11 10:30	KRICHAR
Selenium (Se)	< 1	ug/L		1	EPA 200.8	19-Oct-11 10:30	KRICHAR
Silver (Ag)	< 1	ug/L		1	EPA 200.8	19-Oct-11 10:30	KRICHAR
Zinc (Zn)	< 2	ug/L		2	EPA 200.8	19-Oct-11 10:30	KRICHAR

SELENIUM SPECIATION

Vendor Parameter Complete V_AS&C

Site: BIOREACTOR 1 INF.

Collection Date: 12-Oct-11 10:29 AM

Sample #: 2011021613

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<u>MERCURY 1631</u>							
Vendor Parameter	Complete				V_BRAND		

Site: HG BLANK BIOREACTOR 1 INF.

Collection Date: 12-Oct-11 10:29 AM

Sample #: 2011021614

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<u>MERCURY 1631</u>							
Vendor Parameter	Complete				V_BRAND		

Site: BIOREACTOR 2 INF.

Collection Date: 12-Oct-11 10:35 AM

Sample #: 2011021615

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<u>MERCURY 1631</u>							
Vendor Parameter	Complete				V_BRAND		

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Order # J11100039

Site: Hg Blk BioReactor 2 Inf	Sample #: 2011021616
Collection Date: 12-Oct-11 10:35 AM	Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<u>MERCURY 1631</u>							
Vendor Parameter	Complete				V_BRAND		

Site: BIOREACTOR 2 EFF.	Sample #: 2011021617
Collection Date: 12-Oct-11 10:41 AM	Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<u>MERCURY 1631</u>							
Vendor Parameter	Complete				V_BRAND		

Site: Hg Blk BioReactor 2 Eff	Sample #: 2011021618
Collection Date: 12-Oct-11 10:41 AM	Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	Method	Analysis Date/Time	Analyst
<u>MERCURY 1631</u>							
Vendor Parameter	Complete				V_BRAND		



**APPLIED SPECIATION
AND CONSULTING, LLC**

18804 Northcreek Parkway Bothell, WA, 98011
Tel: (425) 483-3300 Fax: (425) 483-9818
www.appliedspeciation.com

October 21, 2011

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078
(704) 875-5245

Project: Belews - FGD WWTS (Bi-Monthly Sampling) (LIMS # J11100039)

Dear Mr. Perkins,

Attached is the report associated with four (4) aqueous samples submitted for selenium speciation analysis on October 13, 2011. The samples were received on October 14, 2011 in a sealed cooler at 0.7°C. Selenium speciation analysis was performed via ion chromatography inductively coupled plasma dynamic reaction cell mass spectrometry (IC-ICP-DRC-MS). Any issues associated with the analysis are addressed in the following report.

If you have any questions, please feel free to contact me at your convenience.

Sincerely,

A handwritten signature in black ink that reads "Ben Wozniak".

Ben Wozniak
Project Manager
Applied Speciation and Consulting, LLC

Applied Speciation and Consulting, LLC

Report prepared for:

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078

Project: Belews - FGD WWTS (Bi-Monthly Sampling) (LIMS # J11100039)

October 21, 2011

1. Sample Reception

Four (4) aqueous samples in 125mL HDPE bottles (provided by Applied Speciation and Consulting) were submitted for selenium speciation analysis on October 13, 2011. The samples were received on October 14, 2011 in a sealed container at 0.7°C.

The samples were received in a laminar flow clean hood void of trace metals contamination and ultra-violet radiation. Upon reception, the samples were designated discrete sample identifiers. An aliquot of each sample was filtered (0.45µm) and these filtrates were stored in a secure, monitored cryofreezer (maintained at a temperature of -80°C) until selenium speciation analysis could be performed via ion chromatography inductively coupled plasma dynamic reaction cell mass spectrometry (IC-ICP-DRC-MS).

2. Sample Preparation

All sample preparation is performed in laminar flow clean hoods known to be free from trace metals contamination. All applied water for dilutions and sample preservatives are monitored for contamination to account for any biases associated with the sample results.

Selenium Speciation Analysis by IC-ICP-DRC-MS Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45µm) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of the samples may shift the equilibrium of the system resulting in changes in speciation ratios.

3. Sample Analysis

All sample analysis is preceded by a minimum of a five-point calibration curve spanning the entire concentration range of interest. Calibration curves are performed at the beginning of

each analytical day. All calibration curves, associated with each species of interest, are standardized by linear regression resulting in a response factor. All sample results are **instrument blank corrected** to account for any operational biases associated with the analytical platform.

Prior to sample analysis, all calibration curves are verified using second source standards which are identified as initial calibration verification standards (ICV).

Ongoing instrument performance is identified by the analysis of continuing calibration verification standards (CCV) and continuing calibration blanks (CCB) at a minimal interval of every ten analytical runs.

Selenium Speciation Analysis by IC-ICP-DRC-MS All samples for selenium speciation analysis were analyzed by ion chromatography inductively coupled plasma dynamic reaction cell mass spectrometry (IC-ICP-DRC-MS) on October 17-18, 2011. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic ($\text{pH} > 7$) gradient. The eluting selenium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (DRC) containing a specific reactive gas which preferentially reacts with interfering ions of the same target mass to charge ratios (m/z). A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

4. Analytical Issues

The overall analyses went well and no significant analytical issues were encountered. All quality control parameters associated with these samples were within acceptance limits with the following exceptions:

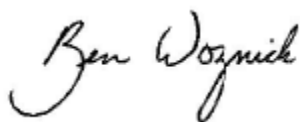
The recoveries associated with the matrix spike (MS) and matrix spike duplicate (MSD) performed on the sample identified as Batch QC were below the established control limit of 75% for selenocyanate (54.4% and 51.2%, respectively). The MS and MSD also included selenite in the spiking solution which yielded elevated recoveries (139.1% and 143.3%, respectively). The low recoveries for selenocyanate correlate with the elevated recoveries of selenite suggesting that the sample matrix induces species conversion. The fact that no species conversion was observed in the ICV or CCVs, which contain both selenite and selenocyanate, demonstrates that the applied method stabilizes these selenium species in solution. Since the conversion of selenocyanate to selenite in the MS and MSD is a function of the sample matrix and the recoveries confirm a mass balance, no corrective action was required. The reported results are deemed representative of the supplied samples and suggest that selenocyanate is not stable in the spiked sample matrix.

The estimated method detection limits (eMDLs) for selenite, selenate, and selenocyanate are generated from replicate analyses of the lowest standard in the calibration curve. Not all selenium species are present in preparation blanks; therefore, eMDL calculations based on preparation blanks are artificially biased low.

The eMDL for methylseleninic acid and selenomethionine is calculated from the average eMDL of selenite, selenate, and selenocyanate. The calibration does not contain methylseleninic acid or selenomethionine due to impurities in these standards which would bias the results for other selenium species.

If you have any questions or concerns regarding this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink that reads "Ben Wozniak". The signature is written in a cursive, flowing style.

Ben Wozniak
Project Manager
Applied Speciation and Consulting, LLC

Selenium Speciation Results for Duke Energy
 Project Name: Belews - FGD WWTS (Bi-Monthly Sampling)
 Contact: Jay Perkins
 LIMS #J11100039

Date: October 21, 2011
 Report Generated by: Ben Wozniak
 Applied Speciation and Consulting, LLC

Sample Results

Sample ID	Se(IV)	Se(VI)	SeCN	MeSe(IV)	SeMe	Unknown Se Species (n)
FGD Purge Eff	14.9	1030	ND (<1.3)	ND (<1.5)	ND (<1.5)	0 (0)
BioReactor 1 Inf	16.0	1070	ND (<0.34)	1.00	ND (<0.37)	0 (0)
BioReactor 2 Eff	1.61	6.40	ND (<0.34)	ND (<0.37)	ND (<0.37)	0 (0)
Metals Trip Blk	ND (<0.097)	ND (<0.055)	ND (<0.067)	ND (<0.073)	ND (<0.073)	0 (0)

All results reflect the applied dilution and are reported in µg/L

ND = Not detected at the applied dilution

SeCN = Selenocyanate

MeSe(IV) = Methylseleninic acid

SeMe = Selenomethionine

Unknown Se Species = Total concentration of all unknown Se species observed by IC-ICP-MS

n = number of unknown Se species observed

Selenium Speciation Results for Duke Energy
 Project Name: Belews - FGD WWTS (Bi-Monthly Sampling)
 Contact: Jay Perkins
 LIMS #J11100039

Date: October 21, 2011
 Report Generated by: Ben Wozniak
 Applied Speciation and Consulting, LLC

Quality Control Summary - Preparation Blank Summary

Analyte (µg/L)	PBW1	PBW2	PBW3	PBW4	Mean	StdDev	eMDL*	eMDL 10x	eMDL 50x	eMDL 200x
Se(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.097	0.48	1.9
Se(VI)	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.055	0.28	1.1
SeCN	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.067	0.34	1.3
MeSe(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.073	0.37	1.5
SeMe	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.073	0.37	1.5

eMDL = Estimated Method Detection Limit

*Please see narrative regarding eMDL calculations

Quality Control Summary - Certified Reference Materials

Analyte (µg/L)	CRM	True Value	Result	Recovery
Se(IV)	LCS	9.57	11.24	117.5
Se(VI)	LCS	9.48	10.01	105.6
SeCN	LCS	8.92	9.239	103.6
MeSe(IV)	LCS	6.47	5.847	90.4
SeMe	LCS	9.32	9.200	98.7

Selenium Speciation Results for Duke Energy
 Project Name: Belews - FGD WWTS (Bi-Monthly Sampling)
 Contact: Jay Perkins
 LIMS #J11100039

Date: October 21, 2011
 Report Generated by: Ben Wozniak
 Applied Speciation and Consulting, LLC

Quality Control Summary - Matrix Duplicates

Analyte (µg/L)	Sample ID	Rep 1	Rep 2	Mean	RPD
Se(IV)	Batch QC*	12.0	11.9	11.9	0.8
Se(VI)	Batch QC*	973.3	1020	996.7	4.7
SeCN	Batch QC*	ND (<1.3)	ND (<1.3)	NC	NC
MeSe(IV)	Batch QC*	ND (<1.5)	ND (<1.5)	NC	NC
SeMe	Batch QC*	ND (<1.5)	ND (<1.5)	NC	NC

ND = Not detected at the applied dilution

NC = Value was not calculated due to one or more concentrations below the eMDL

* Batch QC performed on sample from LIMS # J11100235

Quality Control Summary - Matrix Spike/ Matrix Spike Duplicate

Analyte (µg/L)	Sample ID	Spike Conc	MS Result	Recovery	Spike Conc	MSD Result	Recovery	RPD
Se(IV)	Batch QC*	1112	1559	139.1**	1112	1606	143.3**	3.0
Se(VI)	Batch QC*	1009	2025	101.9	1009	2077	107.1	2.6
SeCN	Batch QC*	915.0	497.9	54.4**	915.0	468.2	51.2**	6.1

* Batch QC performed on sample from LIMS # J11100235

** The recovery is outside the established control limits of 75-125%; please see narrative

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM



Duke Energy Analytical Laboratory

Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

Analytical Laboratory Use Only

ORDER# J1100039

MATRIX: OTHER

Samples
Originating
From

NC
SC

Page 16 of 27

DISTRIBUTION
ORIGINAL to LAB,
COPY to CLIENT

Logged By

Date & Time

10-13-11 7:51

SAMPLE PROGRAM Ground
Water NPDES
Drinking Water
UST
RCRA Waste

AS&C
PO#133241

4.3
Cooler Temp (C)

15 Preserv.: 1=HCL
2=H₂SO₄ 3=HNO₃
4=Ice 5=None

4 3,4

4 3,4

4

MR #

Customer to complete all
appropriate non-shaded areas.

Sampling conducted: 2nd and 4th Wednesday

Date Time Signature

17 Comp.

18 Grab

TDS

Hg - 245.1

Br (Dionex)

Metals*

Se, soluble (no dig.)

Se, speciation - vendor to
AS&C (Important to place filled
bottle back into both baggies)

Filtering of the Se is performed in the field please provide a filter blank too.

1) Project Name

Belews - FGD
WWTS Bi-Monthly Sampling)

2) Phone No:

2) Client:

Bill Kennedy, Melonie Martin,
Wayne Chapman, Tom Johnson **

4) Fax No:

5) Business Unit:

6) Process:

Mail Code:

8) Oper. Unit:

9) Res. Type:

10) Reso. Center:

LAB USE ONLY

11) Lab ID

2011021606
07
08
09
610
611
612

Customer to complete appropriate columns to right

Se Speciation Bottle

ID

13 Sample Description or ID

B14078

FGD Purge Eff

10/12

11:08

TO

B14041

BioReactor 1 Inf

10/12

10:29

TO

B14057

BioReactor 2 Eff

10/12

10:41

TO

B14063

Filter Blk

10/12

10:22

TO

Metals Trip Blk

1) Relinquished By

Date/Time

10/12/2011

2) Accepted By

Date/Time

10-12-11 1330

3) Relinquished By

Date/Time

10-12-11 1535

4) Accepted By

Date/Time

10-12-11 1535

5) Relinquished By

Date/Time

10-13-11 1300

6) Accepted By:

Date/Time

7) Relinquished By

Date/Time

8) Accepted By:

Date/Time

9) Seal/Locked By

Date/Time

10-13-11

10) Seal/Lock Opened By

Date/Time

10/14/11 1500 T.O.F.

11) Seal/Locked By

Date/Time

12) Seal/Lock Opened By

Date/Time

10/14/11 1500

Comments

* B by ICP

As, Cr, Cu, Ni, Se, Ag, Zn by IMS

Digestions = TRM

thomas.d.johnson@siemens.com

Customer, IMPORTANT!
Please indicate desired turnaround.

22 Requested Turnaround

14 Days

* 7 Days

* 48 Hr

* Other

* Add. Cost Will Apply

10-20-11

October 26, 2011

Duke Energy
ATTN: Jay Perkins
Scientific Support-Laboratory
13339 Hagers Ferry Road
Huntersville NC 28078
jcperkins@duke-energy.com
labcustomer@duke-energy.com

RE: Project DUK-HV1101

Client Project: J11100039

Dear Mr. Perkins,

On October 14, 2011, Brooks Rand Labs (BRL) received three (3) flue gas desulfurization (FGD) wastewater samples and three (3) corresponding blank samples. Samples were logged-in for total mercury (Hg) analysis. All samples were received, prepared, analyzed, and stored according to BRL SOPs and EPA methodology.

The results were blank-corrected as described in the calculations section of the applicable SOP(s) and may be evaluated using adjusted reporting limits to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific detection limits and other details. Aside from concentration qualifiers, all data was reported without qualification and all associated quality control sample results met the acceptance criteria.

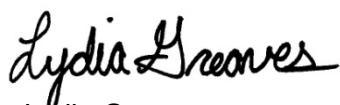
It should be noted that a matrix spike/matrix spike duplicate (MS/MSD) set was not analyzed on one of the samples from this work order. A similar sample from a different work order had a MS/MSD set analyzed and that has been reported.

The sample *Hg Blk BioReactor 2 Eff* (1142048-06) was identified as a field blank, but had a detectable result that was comparable to the associated sample. It was also noticed that when preserved, *Hg Blk BioReactor 2 Eff* (1142048-06) reacted similarly to a sample and not a field blank.

BRL, an accredited laboratory, certifies the reported results of all analyses for which BRL is NELAP accredited meet all NELAP requirements. For more details, see the *Report Information* page of the report.

Please feel free to contact me if you have any questions regarding this report.

Sincerely,



Lydia Greaves
Project Manager
lydia@brooksrn.com

Report Information

Laboratory Accreditation

BRL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BRL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at <http://www.brooksrand.com/default.asp?contentID=586>. Results reported relate only to the samples listed in the report.

Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

Common Abbreviations

BLK	method blank	MS	matrix spike
BRL	Brooks Rand Labs	MSD	matrix spike duplicate
BS	laboratory fortified blank	ND	non-detect
CAL	calibration standard	NR	non-reportable
CCV	continuing calibration verification	PS	post preparation spike
COC	chain of custody record	REC	percent recovery
CRM	certified reference material	RPD	relative percent difference
D	dissolved fraction	RSD	relative standard deviation
DUP	duplicate	SCV	secondary calibration verification
ICV	initial calibration verification	SOP	standard operating procedure
MDL	method detection limit	SRM	standard reference material
MRL	method reporting limit	T	total recoverable fraction

Definition of Data Qualifiers

(Effective 9/23/09)

B	Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
E	An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
H	Holding time and/or preservation requirements not met. Result is estimated.
J	Estimated value. A full explanation is presented in the narrative.
J-M	Duplicate precision (RPD) for associated QC sample was not within acceptance criteria. Result is estimated.
J-N	Spike recovery for associated QC sample was not within acceptance criteria. Result is estimated.
M	Duplicate precision (RPD) was not within acceptance criteria. Result is estimated.
N	Spike recovery was not within acceptance criteria. Result is estimated.
R	Rejected, unusable value. A full explanation is presented in the narrative.
U	Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
X	Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.

These qualifiers are based on those previously utilized by Brooks Rand, Ltd., those found in the EPA SOW ILM03.0, Exhibit B, Section III, pg. B-18, and the USEPA Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses; USEPA; July 2002. These supersede all previous qualifiers ever employed by BRL.

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
BioReactor 1 Inf	1142048-01	Influent	Sample	10/12/2011	10/14/2011
Hg Blk BioReactor 1 Inf	1142048-02	DIW	Field Blank	10/12/2011	10/14/2011
BioReactor 2 Inf	1142048-03	Influent	Sample	10/12/2011	10/14/2011
Hg Blk BioReactor 2 Inf	1142048-04	DIW	Field Blank	10/12/2011	10/14/2011
BioReactor 2 Eff	1142048-05	Effluent	Sample	10/12/2011	10/14/2011
Hg Blk Bio Reactor 2 Eff	1142048-06	DIW	Field Blank	10/12/2011	10/14/2011

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
Hg	Water	EPA 1631	10/21/2011	10/25/2011	B111723	1100738

Sample Results

Sample	Analyte	Report Matrix	Fraction	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
BioReactor 1 Inf										
1142048-01	Hg	Influent	T	41700		76.5	204	ng/L	B111723	1100738
BioReactor 2 Eff										
1142048-05	Hg	Effluent	T	412		3.03	8.08	ng/L	B111723	1100738
BioReactor 2 Inf										
1142048-03	Hg	Influent	T	2460		15.3	40.8	ng/L	B111723	1100738
Hg Blk Bio Reactor 2 Eff										
1142048-06	Hg	DIW	T	527		1.52	4.04	ng/L	B111723	1100738
Hg Blk BioReactor 1 Inf										
1142048-02	Hg	DIW	T	0.38	B	0.15	0.41	ng/L	B111723	1100738
Hg Blk BioReactor 2 Inf										
1142048-04	Hg	DIW	T	0.15	U	0.15	0.41	ng/L	B111723	1100738

Accuracy & Precision Summary

Batch: B111723
Lab Matrix: Water
Method: EPA 1631

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B111723-SRM1	Certified Reference Material (1140052, THg ICV 1641d)						
	Hg		15.68	14.44	ng/L	92% 85-115	
B111723-MS2	Matrix Spike (1143014-01)						
	Hg	436.0	2020	2506	ng/L	102% 71-125	
B111723-MSD2	Matrix Spike Duplicate (1143014-01)						
	Hg	436.0	2020	2473	ng/L	101% 71-125	1% 24

Method Blanks & Reporting Limits

Batch: B111723
Matrix: Water
Method: EPA 1631
Analyte: Hg

Sample	Result	Units
B111723-BLK1	0.04	ng/L
B111723-BLK2	0.0008	ng/L
B111723-BLK3	0.05	ng/L
B111723-BLK4	0.02	ng/L
Average: 0.03		Standard Deviation: 0.02
Limit: 0.50		Limit: 0.10
		MDL: 0.15
		MRL: 0.41

Instrument Calibration

Sequence: 1100738
Instrument: THG-05
Date: 10/25/2011
Analyte: Hg

Total Mercury and Mercury Speciation by CVAFS
Method: EPA 1631

Lab ID	True Value	Result	Units	REC & Limits	
1100738-IBL1		8.42	pg of Hg		
1100738-IBL2		8.90	pg of Hg		
1100738-IBL3		7.23	pg of Hg		
1100738-IBL4		8.50	pg of Hg		
1100738-CAL1	25.00	24.03	pg of Hg	96%	
1100738-CAL2	100.0	99.48	pg of Hg	99%	
1100738-CAL3	500.0	511.0	pg of Hg	102%	
1100738-CAL4	2500	2549	pg of Hg	102%	
1100738-CAL5	10000	10050	pg of Hg	100%	
1100738-ICV1	1568	1444	pg of Hg	92%	85-115
1100738-CCB1		12.1	pg of Hg		
1100738-CCV1	500.0	514.6	pg of Hg	103%	77-123
1100738-CCB2		8.55	pg of Hg		
1100738-CCV2	500.0	497.9	pg of Hg	100%	77-123
1100738-CCB3		37.1	pg of Hg		
1100738-CCV3	500.0	512.1	pg of Hg	102%	77-123



Sample Containers

Lab ID: 1142048-01			Report Matrix: Influent			Collected: 10/12/2011	
Sample: BioReactor 1 Inf			Sample Type: Sample			Received: 10/14/2011	
Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Bottle FLPE Hg-T	250mL	71443390 30	none	n/a		Cooler
B	EXTRA_VOL	250 mL	71443390 30	none	n/a		Cooler
Lab ID: 1142048-02			Report Matrix: DIW			Collected: 10/12/2011	
Sample: Hg Blk BioReactor 1 Inf			Sample Type: Field Blank			Received: 10/14/2011	
Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Bottle FLPE Hg-T	250mL	71443390 30	none	n/a		Cooler
B	EXTRA_VOL	250 mL	71443390 30	none	n/a		Cooler
Lab ID: 1142048-03			Report Matrix: Influent			Collected: 10/12/2011	
Sample: BioReactor 2 Inf			Sample Type: Sample			Received: 10/14/2011	
Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Bottle FLPE Hg-T	250mL	71443390 30	none	n/a		Cooler
B	EXTRA_VOL	250 mL	71443390 30	none	n/a		Cooler
Lab ID: 1142048-04			Report Matrix: DIW			Collected: 10/12/2011	
Sample: Hg Blk BioReactor 2 Inf			Sample Type: Field Blank			Received: 10/14/2011	
Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Bottle FLPE Hg-T	250mL	71443390 30	none	n/a		Cooler
B	EXTRA_VOL	250 mL	71443390 30	none	n/a		Cooler
Lab ID: 1142048-05			Report Matrix: Effluent			Collected: 10/12/2011	
Sample: BioReactor 2 Eff			Sample Type: Sample			Received: 10/14/2011	
Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Bottle FLPE Hg-T	250mL	71443390 30	none	n/a		Cooler
B	EXTRA_VOL	250 mL	71443390 30	none	n/a		Cooler

Project ID: DUK-HV1101
PM: Tiffany Stilwater



Page 24 of 27
Client PM: Jay Perkins
Client PO: 141391

Sample Containers

Lab ID: 1142048-06

Sample: Hg Blk Bio Reactor 2 Eff

Report Matrix: DIW

Sample Type: Field Blank

Collected: 10/12/2011

Received: 10/14/2011

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Bottle FLPE Hg-T	250mL	71443390 30	none	n/a		Cooler
B	EXTRA_VOL	250 mL	71443390 30	none	n/a		Cooler

Shipping Containers

Cooler

Received: October 14, 2011 9:00

Tracking No: 472679664810 via FedEx

Coolant Type: Ice

Temperature: 3.6 °C

Description: Cooler

Damaged in transit? No

Returned to client? No

Custody seals present? No

Custody seals intact? No

COC present? Yes



Duke Energy Analytical Laboratory

Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

1) Project Name Belews - FGD WWTS Bi-Monthly Sampling)	2) Phone No:	
2) Client: Bill Kennedy, Melonie Martin, Wayne Chapman, Tom Johnson **	4) Fax No:	
5) Business Unit:	6) Process:	Mail Code:
8) Oper. Unit:	9) Res. Type:	10) Reso. Center:

Analytical Laboratory Use Only		
ORDER# J11100039	MATRIX: OTHER	Samples Originating From NC <input checked="" type="checkbox"/> SC <input type="checkbox"/>
Logged By Am	Date & Time 10-13-11 7:51	SAMPLE PROGRAM Water _____ Ground NPDES Drinking Water UST _____ RCRA Waste _____
AS&C PO#133241		Cooler Temp (C) 4.3
MR #		15 Preserv.: 1=HCL 2=H ₂ SO ₄ 3=HNO ₃ 4=Ice 5=None

19 Page 1 of 2
DISTRIBUTION 26 of 27
ORIGINAL to LAB,
COPY to CLIENT

LAB USE ONLY	
11 Lab ID	
2011021606	
07	
08	
09	
610	
611	
612	

Se Speciation Bottle		13 Sample Description or ID	Date	Time	Signature	17 Comp.	18 Grab	TDS	Hg - 245.1	Br (Dionex)	Metals*	Se, soluble (no dig.)	Se, speciation - vendor to AS&C (Important to place filled bottle back into both baggies)
ID													
B14078		FGD Purge Eff	10/12	11:08	TO			1	1	1	1		1
		EQ Tank Eff.	10/12	10:56	TO				1		1		
B14041		BioReactor 1 Inf	10/12	10:29	TO						1	1	1
		BioReactor 2 Inf	10/12	10:35	TO						1		
B14057		BioReactor 2 Eff	10/12	10:41	TO				1	1	1		1
		Filter Blk	10/12	10:22	TO							1	
B14063		Metals Trip Blk									1		1
Filtering of the Se is performed in the field please provide a filter blank too.													

1) Relinquished By [Signature]	Date/Time 10/12/2011	2) Accepted By [Signature]	Date/Time 10-12-11 1330
3) Relinquished By [Signature]	Date/Time 10-12-11 1535	4) Accepted By [Signature]	Date/Time 10-12-11 1535
5) Relinquished By [Signature]	Date/Time 10-13-11 1300	6) Accepted By	Date/Time
7) Relinquished By	Date/Time	8) Accepted By	Date/Time
9) Seal/Locked By [Signature]	Date/Time 10-13-11	10) Seal/Lock Opened By	Date/Time
11) Seal/Locked By	Date/Time	12) Seal/Lock Opened By	Date/Time
Comments * B by ICP As, Cr, Cu, Ni, Se, Ag, Zn by IMS Digestions = TRM thomas.d.johnson@siemens.com			

Customer, IMPORTANT!
Please indicate desired turnaround.

22 Requested Turnaround
14 Days _____
* 7 Days _____
* 48 Hr _____
* Other _____
* Add. Cost Will Apply
10-20-11



Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

Analytical Laboratory Use Only

ORDER # <i>J111 00039</i>	Sample Class OTHER	Samples Originating From NC <input checked="" type="checkbox"/> SC <input type="checkbox"/>
Logged By <i>Am</i>	Date & Time <i>10-13-11 7:51</i>	SAMPLE PROGRAM Water <input type="checkbox"/> Ground NPDES Drinking Water UST <input type="checkbox"/> RCRA Waste <input type="checkbox"/>
Cooler Temp (C) <i>4.3</i>		
Preserv.: 1=HCL 2=H ₂ SO ₄ 3=HNO ₃ 4=Ice 5=None		

¹⁹Page 2 of 2
DISTRICT 1007
ORIGINAL to LAB,
COPY to CLIENT

1) Project Name Belews - FGD		2) Phone No:
WWTS (2011, Bi-Weekly Sampling)		
2) Client: Bill Kennedy, Melonie Martin, Wayne Chapman, Tom Johnson *		4) Fax No:
5) Business Unit:	6) Process:	Mail Code:
8) Oper. Unit:	9) Res. Type:	10) Reso. Center:

Customer to complete all appropriate non-shaded areas.			MR #		16 Analyses Required	
Sampling conducted: 2nd Wednesday each month						
ID	13 Sample Description or ID	Date	Time	Signature	17 Comp.	18 Grab
	BioReactor 1 Inf	10/12	10:29	TO		
	Hg Blk BioReactor 1 Inf	10/12	10:29	TO		
	BioReactor 2 Inf	10/12	10:35	TO		
	Hg Blk BioReactor 2 Inf	10/12	10:35	TO		
	BioReactor 2 Eff	10/12	10:41	TO		
	Hg Blk BioReactor 2 Eff	10/12	10:41	TO		
Use the Bioreactor 2 Inf or EFF sample as the MS/MSD						

LAB USE ONLY
11 Lab ID
20/102/16/13
14
15
16
17
18

Customer to complete appropriate columns to right

Customer to sign & date below - fill out from left to right.

1) Relinquished By <i>[Signature]</i>	Date/Time <i>10/12/11</i>	2) Accepted By <i>[Signature]</i>	Date/Time <i>10-12-11 1330</i>
3) Relinquished By <i>[Signature]</i>	Date/Time <i>10-12-11 1535</i>	4) Accepted By <i>[Signature]</i>	Date/Time <i>10-12-11 1535</i>
5) Relinquished By <i>[Signature]</i>	Date/Time <i>10-13-11 1300</i>	6) Accepted By	Date/Time
7) Relinquished By	Date/Time	8) Accepted By	Date/Time
9) Seal/Locked By <i>[Signature]</i>	Date/Time <i>10-13-11</i>	10) Seal/Lock Opened By	Date/Time
11) Seal/Locked By	Date/Time	12) Seal/Lock Opened By	Date/Time

Customer, IMPORTANT! Please indicate desired turnaround.	22 Requested Turnaround
	14 Days _____
	* 7 Days _____
	* 48 Hr _____
	* Other _____ * Add. Cost Will Apply <i>10-20-11</i>

Comments
* Metals=As, Ag, B, Cu, Cr, Ni, Se, Zn *thomas.d.johnson@siemens.com